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ON THE NITRATES OF TIN, ANTIMONY, AND ARSENIC.

BY GEO. HAY, M.D.

Since the publication (May, 1876), in the Proceedings of the Academy of Natural Sciences of Philadelphia, of my paper on Tin, Antimony, and Arsenic, I have attempted to isolate and procure in the crystalline form the nitrates whose reactions were therein described, and now commit to the Academy the results of my investigations.

Prepared solution of protonitrate of tin as described in previous paper. Placed solution in porcelain cup over another cup containing concentrated sulphuric acid, and alongside of this placed several fragments of caustic soda on ground-glass plate, and covered the entire arrangement with a ground bell-jar with its edge greased. Exhausted the receiver of two-thirds of its air, and left the solution for several days to evaporate. It became a syrupy liquid, of a yellow color, but showing no tendency to crystallization, occupying about one-tenth part of the inside of the cup. On the following day this syrupy liquid had the appearance on the surface of dry gum Arabic, and was gently heaving upwards from some gas being formed beneath the pellicle. Readmitted the air into the receiver and removed the sulphuric acid and the gummy-looking mass to another plate, and covered both with the bell-jar, its edge being greased. My back being turned upon the apparatus, in about ten minutes a somewhat violent explosion took place, without, however, injuring the bell-jar. The bell-jar was filled with dense, orange-red fumes, so dense that I could scarcely see the two cups inside. On removing the bell-jar from the plate, I found that a remarkable change had taken place in the contents of the upper cup. It was now quite full of a white, flaky substance, and a stratum of the same substance was lying upon the glass plate. This substance I examined, and found it to be soluble in hydrochloric acid, and to yield all the reactions of hydrated binoxide of tin. It contained a minute portion of hydrate of metastannic acid, but no protoxide of tin. The yellow, syrupy liquid previously mentioned I believed to have been protonitrate of tin, which had spontaneously decomposed upon being sufficiently inspissated.

Prepared a fresh solution, and evaporated as before for several days in a partial vacuum. When the liquid had assumed the syrupy condition, showing as previously no disposition to crystallize, I removed the cup containing it from the receiver. The substance was entirely soluble in cold water to a clear fluid It yielded with the utmost readiness all the reactions both of nitric acid and protoxide of tin. From the above experiments, I conclude that protonitrate of tin is an uncrystallizable salt, of a yellow color and syrupy consistency, soluble in cold water to a clear fluid; and that, upon being sufficiently inspissated, it is spontaneously decomposed into hydrated binoxide of tin and nitrous acid, that decomposition taking place with explosive violence. Thinking it a dangerous compound, I have not sent a portion of the syrupy liquid to the Academy. The aqueous solution of this nitrate (water 20 parts) remains clear at common temperatures for about a day; but afterwards it becomes cloudy, and after several days is entirely and quietly decomposed into hydrated binoxide of tin and free nitric acid.

Prepared antimony solution as described in previous paper. Evaporated a few drops on a thin watch-glass over sulphuric acid, and examined the dry residue by the microscope. It did not show any crystalline appearances except about the edges of the spot. The remainder of the spot had a reticulated appearance. The crystalline appearance was that of fine double lines.

Evaporated the main portion of the solution, under a bell-jar from which two-thirds of the air had been removed, over sulphuric acid, with some fragments of caustic soda placed upon the plate. After it appeared dry, I allowed several days to elapse to make sure that all free nitric acid was removed. The residue was of a yellowish-white color. Treated this residue with cold-water, and filtered. A portion remained insoluble. The insoluble portion consisted of antimonic acid, into which a portion of the dissolved teroxide had been converted during the process of evaporation. The filtrate was perfectly clear, and gave easily all the distinctive reactions of teroxide of antimony and of nitric acid. The portion dissolved must, therefore, have been a ternitrate of antimony.

Prepared arsenic solution as described in previous paper. Evaporated a few drops on a thin watch-glass over sulphuric acid until perfectly dry, and examined the dry residue by the microscope with a power of 100 diameters. It presented the appearance of bunches of crystals, of which the individual elements appeared to be rhombic plates of a white color, opaque, and very deliquescent, so much so that the crystals while being examined were dissolving, and in a short time were entirely fluid.

Evaporated the main portion of the solution, under the same conditions exactly as with the tin and antimony. Allowed to stand two weeks after it appeared to be dry, and then proceeded to examine. The substance was white, opaque, and very deliquescent. Applied every test for nitric acid, but could get no reaction. It will be remembered that, in my last paper, I stated that I had obtained the tests for pentoxide of arsenic, without mentioning whether teroxide were present or not. After evaporation to dryness in the cold, I find that teroxide of arsenic is absolutely absent, and in its stead I obtained all the peculiar and distinctive reactions for pentoxide of arsenic. I therefore conclude that, even if there be a nitrate of arsenic in a solution freshly prepared as previously described, it is probable that it cannot be isolated, for during evaporation, even in the cold, it is entirely converted into arsenic pentoxide.